Description

Dosing device for feeding an infusion product

Technical Field

This invention relates to a dosing device for feeding an infusion product.

In particular, this invention can be advantageously used for measured feeding of an infusion product such as tea, coffee, camomile or the like to an automatic machine for making infusion packets, which the present specification expressly refers to but without restricting the scope of the invention.

Background Art

Usually, an automatic machine for making infusion packets such as filter bags, sachets, filter-paper pods, etc. comprises a plurality of stations located one after the other along a production line forming part of the automatic machine itself, and including, in particular, a feed station for placing measured quantities or doses of infusion product on a web of filter material used to make the packets.

A station for feeding the infusion product is known from United States patent No.4,870,808, which describes a volumetric dosing unit of the type comprising a drum which rotates about a horizontal axis and which is positioned above the web of filter material advancing in a given direction of feed transversal to said axis of rotation.

Above the drum, there is a hopper that feeds the infusion product into uniformly spaced, open cylindrical cells extending radially into the drum. Inside each cell, there is a piston that slides axially in the cylindrical cell itself.

In the device described in the United States patent, each drum piston is driven by an eccentric cam mechanism including a cam inside the drum associated with a cam follower. The cam follower is positioned on one side of the piston, that is to say,

it is offset with respect to the piston so as to enable the piston to move up and down in the cylindrical cell.

In other words, the cam, which is preferably divided into two separate, arc-shaped parts, drives the piston from a bottom dead centre (first cam part) approximately corresponding to the point where the product dose is discharged onto the web of filter material, to a top dead centre (second cam part) corresponding to the position where the product is received and dosed.

The second cam part is adjustable from the outside of the drum through suitable adjusters enabling the top dead centre of the piston to be located at a different position so as to vary the volume of product inside the dosing cells.

The unit described above has proved effective and accurate and has made it possible to significantly increase the working speeds of modern automatic machinery for the packaging of infusion products.

Recent tests have shown, however, that if the infusion product is mixed with additives or herbs, such as powdered sugar or flavouring substances, the dosing unit has considerable problems and the pistons frequently get jammed inside the cylindrical dosing cells. Jamming is mainly the result of the offset arrangement of the components acting on each piston.

If the product being dosed has inherent lubricating properties, any product that escapes past the edges of the piston does not cause problems for the sliding motion of the piston. On the other hand, products with additives, sugar or flavourings may, in time, adhere to the sides of the cell in which the piston slides, forming a layer that (however thin) increases the friction between the piston and the cell and leads to jamming.

Indeed, the constantly increasing friction eventually blocks the axial movement of the piston, bringing the packaging machine to a stop and making it necessary to dismantle the drum in order to clean it or to change it entirely. This means prolonged down times and the need to have a spare drum in stock at all times, with all the additional costs that this involves.

The aim of this invention is to provide a dosing device that overcomes the disadvantages described above.

In particular, it is an aim of this invention to provide a high-performance, high-output infusion product dosing device offering maximum dosing precision and operating reliability independently of the type of product to be dosed.

Disclosure of the Invention

Accordingly, the present invention provides a dosing device for feeding an infusion product, comprising conveying means of the rotary drum type, positioned between a web of filter material and a hopper for containing the infusion product; the drum type conveyor means having a plurality of radial cells made in it for containing the infusion product and in which there slide piston type dosing means; each dosing piston being driven axially by respective eccentric cam actuating means between two end positions, one of which corresponds to a top dead centre where each dosing cell faces the hopper in order to receive a quantity of the infusion product, and the other corresponds to a bottom dead centre where the dosing cell faces the web of filter material in order to discharge the quantity of infusion product onto the web of filter material; the dosing device being characterised in that between the actuating means and each piston there are crank mechanisms designed to act coaxially on the piston in such a way as to enable the piston to move in a direction that is perfectly aligned with a longitudinal axis of the respective dosing cell.

Brief Description of the Drawings

The technical characteristics of the invention, with reference to the above aims, are clearly described in the claims below and its advantages are apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention provided merely by way of example without restricting the scope of the inventive concept, and in which:

- Figure 1 is a schematic front view, partly in cross section and with some parts cut away for clarity, of a preferred embodiment of the dosing device according to the invention;

- Figure 2 illustrates the dosing device of Figure 1 in a

schematic front view showing the actuating means of the dosing device;

- Figure 3 is a lateral cross section through line III-III of the dosing device of Figure 1; and

- Figure 4 is a top plan view, with some parts in cross-section and others cut away, of a detail from Figure 3, showing the crank mechanism of the dosing device according to the invention.

Detailed Description of the Preferred Embodiments of the Inventions

With reference to Figures 1 and 2, the dosing device according to the invention, labelled 1 in its entirety, is used for feeding an infusion product (tea, coffee, camomile, etc.) to an automatic machine (of known type and therefore not illustrated) which is designed to make packets containing the infusion product and of which the dosing device forms an integral part.

The device 1 comprises a first drum 2 that rotates about a horizontal axis Y in an anticlockwise direction V in Figures 1 and 2, the first drum 2 being positioned between a web 3 of filter paper advancing tangentially at the bottom of it and an infusion product feed hopper 4 at the top of it.

In Figures 1 and 2, the web 3 of filter paper is drawn with a dashed line and is advanced continuously in a horizontal feed direction A.

As illustrated in Figures 1, 2 and 3, the first drum 2 has, on its lateral cylindrical surface, a plurality of radial cells 5 for containing the infusion product and within which respective dosing pistons 6 slide axially (arrow F), driven by respective actuating cam means 7 acting on each piston 6.

More specifically, the cam means 7 move the pistons 6 between two end positions (shown in Figures 1 and 2), one of which corresponds to a top dead centre PMS where the dosing cell 5 faces the hopper 4, and in particular, a levelling blade 27, in order to receive a quantity of the infusion product, and the other corresponds to a bottom dead centre PMI where the dosing cell 5 faces the web 3 of filter material in order to discharge the

quantity of infusion product onto the web 3 of filter material.

Again with reference to Figures 1 and 2, the cam means 7 comprise, for each piston 6, at least one circular cam track 7a in which a cam follower 7b runs.

More specifically, the cam track 7a consists of two separate, substantially semicircular segments 7a, 25 which enable the pistons 6 to move in the manner described above: the segment 25 (Figures 2 and 3) is fixed and enables each piston 6 to discharge the dose onto the web 3; the segment 7a, on the other hand, is adjustable by suitable means 26 that protrude from the first drum 2 in order to adjust the distance, within a predetermined range, between the piston 6 and the outside surface of the first drum 2 so as to vary the quantity of infusion product that is placed in the respective dosing cell 5.

The infusion product dose is then levelled off by the levelling blade 27 which consists of an arc-shaped plate positioned on the path of the first drum 2.

As shown in Figure 3, between the cam means 7 and each piston 6 there is a crank mechanism 8 designed to act coaxially on the piston 6 in such a way as to permit the reciprocating motion of the piston 6 itself along the axis Z of the cell 6, in a direction always perfectly aligned with the axis Z.

As illustrated in Figures 3 and 4, the crank mechanism 8 is rotatably mounted on a second drum 9, which is associated with the first drum 2, being mounted inside the first drum 2, and sealed off from the first drum 2 by interposed sealing means 28, and which rotates as one with the drum 2 about the aforementioned horizontal axis Y.

Looking in more detail, each crank mechanism 8 comprises a first crank 10 connected at one end to the cam follower 7b and, at the other end, to a transmission shaft 11 that is rotatably supported in a respective hole 12 passing through the second drum 9.

The shaft 11 is rigidly attached at the opposite, free end which protrudes from the second drum 9, to a first end of a second crank 13.

The second crank 13 is in turn connected at its other end to

a first end 14a of a connecting control rod 14 connected along the axis Z of the cell 5, and, at its other end, to the piston 6: this creates a mechanism much like a crankshaft and, as shown in Figure 3, makes it possible to apply a pushing and pulling action centrally on the piston 6.

Looking more closely at the technical details, the first end of the second crank 13 is rigidly attached to the shaft 11 by a key 15 in such a way that motion between the cam follower 7b and the piston can be transmitted directly and correctly.

As clearly illustrated in Figure 4, the end of the crank 13 that is linked to the connecting rod 14 is fork-shaped so as to hold the end of the connecting rod 14 on both sides, thus obtaining a correct axial movement along the respective cell 5.

The connecting rod 14 is coupled with the second crank 13 through a first pin 16 that passes through a respective hole 17 made in the forked end of the second crank 13 itself.

At the other end, the connecting rod 14 is linked to the piston 6 by a second, transversal pin 18 which is housed in a respective hole 19 made in the piston 6 and which engages the respective end of the connecting rod 14.

To enable the motion of the cam follower 7b to be transmitted correctly to the piston 6, each transmission shaft 11 has two bearings 20 and 21 positioned between the shaft 11 itself and the hole 12 in the second drum 9 in such a way as to rotate the entire crank drive mechanism for the piston 6.

The operation of the dosing device 1 may be easily inferred from the above description with reference to the accompanying drawings and will not therefore be described in further detail.

The dosing device structured as described above therefore achieves the aforementioned aims thanks to the application of a crank mechanism which enables each piston to be driven in a precise axial direction in such a way as to obtain a correct and reliable movement at all times, irrespective of the type of product being dosed.

The application of this crank mechanism does not affect the overall dimensions of the device since the working parts for transmitting drive to the pistons remain unchanged.

The compactness of the crank and connecting rod assembly also permits an extremely precise and fast up and down driving action on the pistons, keeping each piston parallel to the respective dosing cell in which it slides in a direction that is at all times exactly aligned with the longitudinal axis of the cell itself, thus preventing the pistons from seizing up during normal operation.

The provision of a second drum mounted inside the first drum and sealed off from the latter isolates the drive mechanisms and makes it possible to keep them clean. It also slightly increases the total thickness of the dosing unit and allows the above mentioned actuating cam means to be positioned in a more convenient area, with a more compact cam control which, in practice, reduces the overall dimensions compared to the prior art device, where the control mechanism protrudes from the first drum and is further away from the cam.

The invention described can be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.